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Therefore

$$y = \tan(\delta - D) + \tfrac{1}{2}x^2 \tan\delta - \tfrac{1}{8}x^4 \tan\delta \, \frac{\cos(\delta - D)\cos(\delta + D)}{\cos^2\delta}$$

$$+ \tfrac{1}{16}\, x^6 \tan\delta \, \frac{\cos^2(\delta - D)\cos^2(\delta + D)}{\cos^2\delta} - \&c.$$

This formula shows explicitly the magnitude of the correction at different declinations to the approximate formula

$$y = \tan(\delta - D) + \tfrac{1}{2}x^2 \tan\delta.$$

For example, take the case where $\delta = 85°$, $D = 84°$, and $x = 1°$.

$$-\tfrac{1}{8}x^4 \tan\delta \, \frac{\cos(\delta - D)\cos(\delta + D)}{\cos^2\delta}$$

$$= + \tfrac{1}{8}\frac{\sin^3 1° \, . \, \cos 1° \, . \, \cos 11°}{\sin^3 5°} \times 3600'' = 3''\cdot55.$$

For $\delta = 70°$ the correction can only amount to 0″·06.
This correction can be readily tabulated as far as $\delta = 85°$.

An Analysis of the Distribution of Stars on the 1,180 *Plates in Zones* +25° *to* +31° *allotted to the University Observatory, Oxford, in connection with the International Astrographic Survey.*

By F. A. Bellamy.

1. The completion, on 1904 February 17, of the measurement in two positions of the 1,180 plates required for the zones +25° to +31°, which were allotted to the University Observatory, Oxford, in connection with the International Astrographic Catalogue of Stars to the eleventh magnitude, has afforded the means of revising the figures given by me in a paper (*Monthly Notices*, vol. lx. p. 12) concerning the distribution of stars. It is my intention now only to refer to that portion of the sky to which the resources of the observatory have been mainly devoted during the past twelve years, reserving consideration of the distribution of stars outside +25° to +31° to a future communication.

The plates discussed in the paper referred to were 513 in number, each with exposures of 6^m, 3^m, 20^s, and were exposed between 1892 January and 1899 June; other plates with exposures not precisely of these durations were omitted. In the present paper all plates are included, but only one of the three exposures has been dealt with throughout.

2. In selecting plates considered good, and rejecting others which did not show enough stars, constant use has been made of

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the numbers shown on Argelander's charts for the areas covered by the plates. To obtain these numbers the outline of the area was ruled on glass and laid over the proper portion of the charts, when the number of stars included could be quickly counted. These numbers have been used to form Table II., which corresponds in all details with Table I. As a general rule a plate has always been accepted for measurement if it showed three times as many stars as Argelander. It was at once recognised that this rule would admit plates of inferior quality in the region of the Milky Way; but this was accepted as an advantage from the point of view of limiting the work in these regions. Further, this rule was not adopted until a good deal of the early work had been done and many plates had been measured for which the Argelander ratio was less than 3·0. It may be advisable to repeat these plates, but it was determined to finish the whole work first, since a region not measured at all has stronger claims than one where measures only fall somewhat short of a definite standard. Among the 1,180 plates the Argelander ratio falls below 3·0 for 280 plates; but for most of these it is greater than 2·5.

3. Table I. gives the total number of stars measured. Under R.A. 1^h, Dec. +25° are given the total numbers on plates with centres at declination +25° 0′ and R.A.'s $1^h\ 0^m$, $1^h\ 8^m$, $1^h\ 16^m$, $1^h\ 24^m$, $1^h\ 32^m$, $1^h\ 40^m$, $1^h\ 48^m$, $1^h\ 56^m$; and since each plate in this zone includes about $4\frac{1}{2}$ min. each way from the centre this total will include about $4\frac{1}{2}^m$ of 0^h and about $\frac{1}{2}^m$ of 2^h; in declination it contains the belt from +23° 55′ to +26° 5′. Hence all stars are included at least twice, and on the average about 2·6 times.

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Table I.

Total Number of Stars Measured in each Hour and Zone.

Hours.	+25°.	+26°.	+27°.	+28°.	+29°.	+30°.	+31°.	Totals.	Stars measured to 1899 June.
0	2879 7	1936 8	1623 7	1582 7	1671 7	1233 7	1653 7	12577 50	9283 35
1	2214 8	1533 7	2440 8	1711 7	2097 6	1606 7	1813 6	13414 49	7227 28
2	1738 7	2052 8	1605 7	1261 6	2152 7	1544 6	1974 7	12326 48	5784 25
3	2051 8	1871 7	1864 8	2002 7	2793 7	1269 7	1308 7	13158 51	5428 21
4	1248 7	1330 8	445 7	1022 7	1388 6	1617 7	1245 6	8295 48	3224 18
5	3290 8	2890 7	2241 8	2392 6	1959 7	3977 6	5289 7	22038 49	6578 23
6	2975 7	4470 8	2823 7	4616 7	3450 7	4019 7	2991 7	25344 50	9322 20
7	3480 8	2005 7	1934 8	2630 7	2167 6	2931 7	2506 6	17653 49	6533 23
8	1828 7	1575 8	1420 7	2100 6	2643 7	1453 6	1367 7	12386 48	4751 22
9	1042 8	1323 7	1429 8	2908 7	1362 7	1526 7	1137 7	10727 51	4216 25
10	968 7	1557 8	1160 7	1630 7	994 6	1670 7	1290 6	9269 48	2733 19
11	696 8	967 7	1393 8	1366 6	1036 7	945 6	1210 7	7613 49	1263 12
12	565 7	1110 8	1189 7	2070 7	1065 7	1322 7	1295 7	8616 50	2407 18
13	617 8	622 7	882 8	1574 7	1064 6	1712 7	1318 6	7789 49	2574 23
14	742 7	1461 8	898 7	1059 6	1122 7	1499 6	1725 7	8506 48	2718 19
15	948 8	1042 7	1256 8	1401 7	1391 7	1992 7	1976 7	10006 51	1668 12
16	1256 7	2189 8	995 7	1845 7	1382 6	3449 7	1919 6	13035 48	2208 13
17	2084 8	6239 7	3020 8	1997 6	1735 7	4791 6	2942 7	22808 49	3024 12
18	2067 7	5185 8	5892 7	3459 7	2465 7	3891 7	4078 7	27037 50	5764 16

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Hours.	+25°.	+26°.	+27°.	+28°.	+29°.	+30°.	+31°.	Totals.	Stars measured to 1899 June.
19	2747 8	4536 7	5937 8	5104 7	7687 6	8473 7	9127 6	43611 49	13189 17
20	5011 7	6805 8	5209 7	3034 6	4375 7	5517 6	7622 7	37573 48	12877 23
21	2857 8	2982 7	3229 8	2399 7	3138 7	5074 7	4373 7	24052 51	10673 27
22	2066 7	2829 8	2500 7	2423 7	1738 6	3143 7	3419 6	18118 48	9768 29
23	2059 8	1703 7	1857 8	1341 6	2398 7	2247 6	2249 7	13854 49	8327 23
Totals & Plates	47,428 180	60,212 180	53,241 180	52,926 160	53,272 160	66,900 160	65,826 160	399,805 1180	141,539 513

TABLE IV.

Oxford. Average Number of Stars measured on each Plate, and the Ratio of Oxford Numbers to Argelander.

Hour.	+25° Stars.	+25° Ratio.	+26° Stars.	+26° Ratio.	+27° Stars.	+27° Ratio.	+28° Stars.	+28° Ratio.	+29° Stars.	+29° Ratio.	+30° Stars.	+30° Ratio.	+31° Stars.	+31° Ratio.	Final Results. Stars.	Final Results. Ratio.	Final Results. Stars per Sq. Deg.	Previous Results. Stars.	Previous Results. Ratio.	Previous Results. Stars per Sq. Deg.
0	411	6·7	242	3·8	232	3·7	226	3·7	239	3·9	176	2·7	236	3·6	252	4·0	53·7	265	4·6	56
1	277	4·7	219	3·6	305	5·1	244	4·3	350	6·0	229	3·7	302	4·6	274	4·6	58·4	258	4·3	55
2	248	4·9	256	4·9	229	4·1	210	4·3	307	6·3	257	4·2	282	4·3	257	4·7	54·8	231	4·8	49
3	256	4·2	267	4·0	233	4·1	286	5·9	399	8·8	181	3·5	187	3·3	258	4·7	55·0	259	4·4	55
4	178	4·7	166	4·2	63	1·7	146	3·8	231	2·5	231	3·6	208	3·5	173	3·3	36·7	179	4·4	38
5	411	3·8	413	3·9	280	3·0	399	4·5	280	3·1	663	5·6	756	6·2	450	4·3	96·0	286	3·5	61
6	425	2·9	559	3·7	403	3·1	659	5·9	493	4·7	574	4·6	427	3·8	507	4·0	108·1	466	3·7	99
7	435	4·7	287	3·0	242	2·8	376	4·6	361	4·9	419	4·9	418	4·7	360	4·2	76·8	284	3·3	60

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Hour.	+25°		+26°		+27°		+28°		+29°		+30°		+31°		Final Results.			Previous Results.		
	Stars.	Ratio.	Stars.	Ratio.	Stars.	Ratio.	Stars.	Ratio.	Stars.	Ratio.	Stars.	Ratio.	Stars.	Ratio.	Stars.	Ratio.	Stars per Sq. Deg.	Stars.	Ratio.	Stars per Sq. Deg.
8	261	4·1	197	2·9	203	3·2	350	6·5	378	7·2	242	3·7	195	2·7	258	4·1	55·0	216	3·4	46
9	130	2·4	189	3·3	180	3·4	415	8·6	195	4·3	218	4·0	162	2·7	210	4·0	44·8	169	3·3	36
10	138	3·0	194	4·0	166	3·5	233	5·3	166	4·1	239	4·9	215	4·0	193	4·1	41·2	144	3·1	31
11	87	2·2	138	3·4	174	4·3	228	5·6	148	4·1	158	3·5	173	4·2	155	3·9	33·1	105	2·6	22
12	81	1·8	139	3·1	170	3·9	296	7·8	152	4·3	189	4·0	188	3·8	172	4·0	36·7	134	3·2	29
13	77	2·0	89	2·1	110	3·1	225	5·9	177	4·8	245	5·3	220	4·9	159	4·0	33·9	112	2·9	24
14	106	2·3	183	3·9	128	2·7	176	4·4	160	4·4	250	5·1	246	5·4	177	4·0	37·7	143	3·4	30
15	119	2·5	149	2·9	157	3·4	200	4·6	199	4·5	270	5·5	282	5·7	196	4·1	41·8	139	2·9	30
16	179	3·1	274	4·8	142	2·4	263	4·8	230	4·5	493	7·8	320	5·0	272	4·7	58·0	170	3·0	36
17	261	3·4	891	11·8	378	5·3	333	4·4	248	3·2	799	9·6	420	6·0	465	6·2	99·4	252	3·3	54
18	295	3·0	648	6·5	842	9·1	494	5·4	352	3·9	556	5·4	583	5·5	541	5·5	115·4	360	3·7	77
19	343	2·8	648	5·2	742	5·9	729	5·6	1281	5·2	1210	7·4	1521	8·8	890	5·9	189·9	776	6·3	165
20	716	6·2	851	7·2	744	6·2	506	4·2	625	4·8	920	5·9	1089	6·8	783	6·0	166·9	560	4·7	119
21	357	4·4	426	5·0	404	4·1	343	3·4	448	4·7	725	6·5	625	5·7	472	4·9	100·6	395	4·4	84
22	295	4·0	354	4·9	357	4·4	346	4·4	290	3·5	449	4·6	570	5·9	377	4·6	80·4	337	4·4	72
23	257	4·0	243	3·6	232	3·4	224	3·4	343	5·3	375	4·7	321	4·1	283	4·1	60·3	252	4·0	54
Average	263·5		334·5		295·8		330·8		333·0		418·1		411·4		338·8		72·3	276		58·7
Plates	180		180		180		160		160		160		160		1180			513		
Ratio ...		3·74		4·64		4·24		4·96		4·63		5·30		5·18		4·66			4·0	

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TABLE II.

Total Number of B.D. Stars included in the same Areas as in Table I.

Hours.	+25°.	+26°.	+27°.	+28°.	+29°.	+30.	+31°.	Totals.
0	431	512	443	429	430	461	462	3168
1	467	420	482	403	349	437	392	2950
2	352	419	391	292	340	365	461	2620
3	493	465	451	339	316	358	390	2812
4	267	315	268	269	563	452	359	2493
5	872	748	739	534	627	711	850	5081
6	1019	1201	897	776	741	865	781	6280
7	740	666	689	570	446	596	531	4238
8	448	545	443	323	368	389	503	3019
9	434	396	420	338	318	383	413	2702
10	326	388	329	306	245	339	324	2257
11	321	287	321	242	252	269	290	1982
12	306	356	306	265	248	328	341	2150
13	311	289	287	265	224	324	267	1967
14	327	378	327	242	256	293	322	2145
15	384	359	368	302	308	364	348	2433
16	401	457	413	385	304	440	381	2781
17	618	527	573	450	549	498	494	3709
18	688	803	648	639	638	722	747	4885
19	972	869	998	908	1468	1141	1036	7392
20	806	941	839	729	910	942	1114	6281
21	653	597	794	706	662	778	773	4963
22	514	575	572	555	494	685	575	3970
23	517	470	544	397	446	473	548	3395
Total ...	12,667	12,983	12,542	10,664	11,502	12,613	12,702	85,673

4. Features worthy of remark are the fairly uniform totals, about 2,000 and 3,000, for the hours outside the Milky Way, and the similarity of the average of the three hours densest in stars in the two parts of the Milky Way which cut the Oxford zones about 6^h and 19^h—namely, 5,200 and 6,200. In the Oxford results the numbers are between 8,000 and 13,000 for similar hours in the former case, but in the Milky Way (5^h to 8^h, and 18^h to 21^h) the average Oxford numbers are 21,700 and 36,100; and, as I shall show later in this paper, the average for the 6^h portion might be increased to 23,900, while the 19^h portion would become 47,100. For Argelander the increase from 6^h to 19^h (each mean of three hours) is 19 per cent.; for the Oxford measures the increase is as much as 66 per cent., and might readily be increased to more than 100 per cent. without increasing

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the exposure of 3 min. I have always had a difficulty in obtaining a plate that showed 1,000 stars with a 3 min. exposure in the 6^h part of the Milky Way, but have numerous plates containing 2,000, 3,000, 4,000, and one nearly 5,000 stars with this exposure in the 19^h part.

This is an independent proof of the statement that has been made more than once that Argelander did not observe all the 9·5 mag. stars in the Milky Way, owing to the enormous number that had to be dealt with, but unconsciously decreased his scale by 0·2 mag. The difference between the Oxford and Argelander percentages would be much less if he had added a thousand stars in these two tenths of a magnitude; even a tenth of a magnitude fainter would have added a large number of stars where the increase in number is so rapid.

5. Now this seems to have a very important bearing on Kapteyn's conclusion, which is also supported by Professor S. Newcomb (*Astronomical Journal*, vol. xxi. p. 155), that "the stars of the Milky Way are in general bluer than the stars in other regions of the sky" (*C.P.D.* vol. i. p. [22]). For here the comparison is not between the Milky Way and other regions, but simply between two parts of the Milky Way. If the effect is to be attributed to a physical characteristic of the stars, then we must further conclude that there are variations of stellar luminosity in different parts of the Milky Way itself, in addition to the broad distinction between the Galaxy and other parts of the sky. It is surely simpler and more natural to infer a want of uniformity in the *Bonner Durchmusterung*, and thereby to explain the facts on the single hypothesis that Argelander's limiting magnitude in each region of the sky is a function of the star density.

6. Table III. exhibits all the instances when over 1,000 stars occur on those plates adopted for measurement.

TABLE III.

Dec.	R.A.	No. of Stars in 3 Min.	Plate.	Dec.	R.A.	No. of Stars in 3 Min.	Plate.
°	h m			°	h m		
+26	5 44	1158	1169		17 51	1489	1958
	5 52	1456	1170	+26	18 40	1267	1086
	7 28	1020	1536	+27	18 44	1146	1107
+28	6 18	1287	1734	+28	18 9	1489	1567
+31	5 37	1079	2298	+28	18 36	1165	1560
					18 45	1574	1561
				+29	18 22	1396	1578
+26	17 36	1223	1078		18 40	1401	1579
	17 44	1436	1079	+30	18 27	1064	1595
	17 52	1058	1080		18 36	1042	1596
+30	17 42	1224	1957		18 45	1084	1597

Dec.	R.A.	No. of Stars in 3 Min.	Plate.
°	h m		
+26	19 36	1763	1117
	19 52	1428	1119
+27	19 8	1398	1109
	19 16	1230	1103
	19 48	1176	1112
+28	19 12	1027	1223
	19 21	1100	474
	19 48	1158	858
+29	19 7	2723	1562
	19 16	2856	1563
+29	19 34	1996	851
	19 43	2440	852
	19 52	1270	853
+30	19 12	1057	1876
	19 39	4920	1582
	19 48	4097	1583
	19 57	2561	1584
+31	19 7	1178	1605
	19 16	1342	1999
	19 25	1923	2000
	19 34	2180	1606
	19 43	2210	2008
	19 52	2118	2001
+25	20 12	1181	2289
+26	20 0	1808	1120
	20 8	1774	1121
	20 16	1549	1212
+30	20 6	2097	1568
	20 15	1496	1569
	20 24	2310	1564
	20 33	1541	1570
	20 42	1823	1571
	20 51	2703	1565
+31	20 1	1341	2016
	20 10	1228	1835
	20 19	1325	1834
	20 28	1310	1836
	20 46	1017	2015
+30	21 9	1680	1566
	21 18	1802	1585

From this it can be seen that whilst we have in 5^h, 6^h, and 7^h only five plates with over 1,000 in 3 min. exposure we have fifty-five plates in the later part of the Milky Way, where it is more expanded, with more than 1,000 stars; of these twelve have more than 2,000. The greatest number is obtained on plate 1582, with the centre at R.A. $19^h\ 39^m$ $+30°$.

7. Taking the numbers in Table I. and dividing them by the subscript figures, the average numbers of stars for each hour, each zone, and all zones combined are obtained, and are given in Table IV. (see p. 652) on the left-hand side of each zone; when the numbers in Table I. are divided by the corresponding numbers in Table II. the ratios for Oxford to Argelander are found, and these form the quantities given on the right-hand side of the different zones.

8. Though the ratio of three times Argelander is well exceeded, except in 3^h, in the average for each hour of the seven zones combined and for each zone of twenty-four hours, some hours of all the zones, except +28°, show that this minimum has not been maintained; this is particularly the case in zone +25°, in the hours where there are least stars per square degree. This zone was that first photographed—mostly eleven

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years ago—when the plates used were less sensitive, and a number of plates had been measured previous to the adoption of the standard, as mentioned in the beginning of this paper. A considerable portion of +26° and +27° had been re-photographed before the measurement of the plates had advanced very far; this especially applied to the latter part of the Milky Way in +26°. In the case of some of the hours in +31° the falling off in numbers was largely due to the quality of the plates supplied; though many were retaken, too much time had been spent over the first plates of the region to justify the whole being rejected.

9. The average given at the foot of Table IV. (see p. 652) indicates the improvement in the sensitiveness of the plates. The most southern zone was first photographed; the most northern zones were only photographed within the last two or three years.

The Argelander ratio for the whole 1,180 plates is 4·7; and the average number of stars measured on a plate is 339.

10. So far, except § 6, we have dealt with *actual measures* executed at Oxford. But it has been remarked (see § 2) that there is some lack of uniformity of procedure. The main object kept in view was to measure a fair number of stars all round the sky, and not necessarily to reach the same limit of magnitude in all R.A.'s. To do this we should have to measure an enormous number of stars in the Milky Way, which would have extended the work unduly. It is, however, a simple matter to *count* these plates, which gives all the information required for the study of stellar distribution; and for such counts I proceed to determine the corrections to the above tables necessary to represent the same limits of stellar magnitude round the sky. I will first state exactly how the work was limited in the rich regions.

11. As a first experiment only those stars showing all three images (6^m, 3^m, 20^s) were measured (ten plates only), when in this way at least three times Argelander's number could be obtained. This was found in practice to be too severe a limitation, and the 20 sec. exposure was accordingly increased to 60 sec., which was generally found sufficient to give an Argelander ratio exceeding 3·0; forty-five plates—mostly in the Milky Way—were so measured, *i.e.* those photographed in one minute. In addition to these about eighty-three plates had exposures differing slightly from the regulation 6^m 3^m 20^s; all the remaining 1,042 plates received these exposures.

TABLE V.

Centre. Zone.	R.A.	Plate.	Number Measured.	3^m Images that might have been Measured.	Additional Stars.
+ °	h m				
29	2 55	1860	†117	468	351
25	3 40	1266	†221	422	201
28	3 45	1317	†297	705	408

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Zone. +	Centre. R.A.		Plate.	Number Measured.	3^m Images that might have been Measured.	Additional Stars.
°	h	m				
26	5	44	1169	†687	1158	471
26	5	52	1170	†538	1456	918
29	5	28	1309	†252	628	376
29	5	55	1311	†261	729	468
28	6	0	1733	†329	1875	1546
26	6	8	1171	†455	989	534
28	6	45	1497	†358	882	524
29	6	31	1314	†242	592	350
29	6	58	1315	†312	657	345
26	7	28	1536	†368	1020	652
28	7	3	1499	†324	836	512
26	12	48	1186	†164	276	112
27	17	40	1095	†197	800	603
30	17	51	1958	†345	1489	1144
25	18	4	1198	†410	870	460
25	18	28	1199	†443	943	500
25	18	44	1200	†290	916	626
28	18	9	1567	†463	1375	912
28	18	36	1560	†551	1165	614
28	18	45	1561	†686	1574	888
29	18	22	1578	†611	1396	785
29	18	40	1579	†449	1401	952
30	18	27	1595	†554	1064	510
30	18	36	1596	†496	1042	546
30	18	45	1597	†582	1084	502
27	19	16	1103	†273	1230	957
26	19	36	1117	†292	1763	1471
26	19	44	1118	†203	702	499
26	19	52	1119	†387	1428	1041
28	19	3	1222	†357	974	617
28	19	12	1223	†506	1027	521
29	19	7	1562	†1133	2723	1590
29	19	16	1653	†1097	2856	1759
29	19	52	853	†365	1270	905
30	19	39	1582	†2102	4920	2818
30	19	48	1583	†1469	4097	2628
30	19	57	1584	†1120	2561	1441
31	19	7	1605	†591	1178	587

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Zone.	Centre. R.A.		Plate.	Number Measured.	3^m Images that might have been Measured.	Additional Stars.
+ °	h	m				
31	19	34	1606	†943	2180	1237
26	20	16	1212	†683	1549	866
27	20	20	1225	†395	802	407
30	20	6	1568	†916	2097	1181
30	20	15	1569	†852	1496	644
30	20	24	1564	†909	2310	1401
30	20	33	1570	†754	1541	787
30	20	42	1571	†872	1823	951
30	20	51	1565	†1214	2703	1489
27	21	32	1230	†236	615	379
28	21	9	1240	†242	524	282
28	21	27	1215	†272	738	466
30	21	18	1585	†792	1802	1010
29	22	34	1466	†229	550	321

12. Table V. contains the data relating to the 45 plates with 6^m, 3^m, 1^m exposures, and the 10 plates with 6^m, 3^m, 20^s, upon which only those stars showing all three exposures were measured. The number actually measured is preceded by this symbol, † ; the number that would have been measured in the ordinary way is given in the next column ; the difference or additional stars—those showing the 3^m, but not the 20^s or 1^m exposure—that might be measured at any time are in the last column. If these extra stars be incorporated in the *measured* totals given in Tables I. and IV. we should obtain the amended results exhibited in Table VI., with a total addition of 44,462 stars.

13. To measure these stars it would require nearly 90,000 bisections in each coordinate to be made. This would be an additional year's work for comparatively little advantage, for it will be noticed that nearly all these 44,000 stars are within the region covered by the Milky Way, where, for star *positions*, they can be very well spared, as most of them are probably fainter than the 10·5 magnitude ; but when considering the distribution of stars they should not be omitted in discussing the results. In the latter case any discussion of photographic results is rendered uncertain by that extremely variable quantity the climatic conditions. A small variation of exposure is almost insignificant compared to those conditions and to the varying chemical properties in the emulsion from the time the plate is coated till the finished negative is obtained.

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Table VI.

Difference between the Stars Measured that show the Three Images and those Counted for the 3^{m} *Exposures.*

Hour.	Sums for Hours and Zones.							Additional Stars *Counted*, 3^{m} Exposure.	Stars *Measured* added to previous Column.	Ratio.
	25°.	26°.	27°.	28°.	29°.	30°.	31°.			
0	...	...	...	...	...	...	...	0	12577	3·97
1	...	...	...	...	...	...	...	0	13414	4·55
2	...	...	...	...	351	...	...	351	12677	4·84
3	201	...	...	408	...	...	...	609	13767	4·91
4	...	...	...	...	...	...	...	0	8295	3·33
5	...	1389	...	...	844	...	...	2233	24271	4·78
6	...	534	...	2070	695	...	...	3299	28643	4·56
7	...	652	...	512	...	...	...	1164	18817	4·44
8	...	...	...	...	...	...	...	0	12386	4·11
9	...	...	...	...	...	...	...	0	10727	3·96
10	...	...	...	...	...	...	...	0	9269	4·11
11	...	...	...	...	...	...	...	0	7613	3·85
12	...	112	...	...	...	...	...	112	8728	4·06
13	...	...	...	...	...	...	...	0	7789	3·96
14	...	...	...	...	...	...	...	0	8506	3·97
15	...	...	...	...	...	...	...	0	10006	4·14
16	...	...	...	...	...	...	...	0	13035	4·69
17	...	...	...	...	...	1144	...	1144	23952	6·46
18	1586	...	...	2414	1737	1558	...	7295	34332	7·03
19	...	3011	957	1138	4254	6887	1824	18071	61682	8·34
20	...	866	407	...	...	6453	...	7726	45299	7·21
21	...	...	379	748	...	1010	...	2137	26189	5·28
22	...	...	...	...	321	...	...	321	18439	4·64
23	...	...	...	...	...	...	...	0	13854	4·09
Sums	1787	6564	1743	7290	8202	17052	1824	44462	444267	5·19 Mean

14. A comparison of the final results with those upon which the previous paper communicated to the Society (*Monthly Notices*, vol. lx. p. 12) in 1899 were based may be of interest. It will be noticed (Table VII.) that while more than twice as many plates have been used in the final results nearly three times the number of stars have been included. The number of stars (those showing both the 6^{m} and 3^{m} images) per square degree of ranges from 56·2 in +25° zone to 89·2 in +30° zone ; if the extra stars had been measured the range would be 57·8 to 111·8. The value for the whole of the seven zones photographed at Oxford being 72·3.

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for the stars measured, this is very similar to that found (71·2) at the Royal Observatory, Greenwich, for zones +65° to +69° (inclusive).

15. The last six columns in Table IV. give the details for the separate hours in a similar manner to the results given in Table VII. for each whole zone; the earlier results are added for comparison. In plotting these new values on plate 1 of the former paper I find almost precisely the same *form* of curve results, but generally at a higher level. It may be remarked that the maximum number of stars measured per square degree is 189·9 at 19^{h} (R.A. $19^{\text{h}}\ 0^{\text{m}}$ to $20^{\text{h}}\ 0^{\text{m}}$), and taking only those numbers that are above the mean (72·3) the Milky Way may be considered to extend from R.A. $16\frac{1}{4}^{\text{h}}$ to $22\frac{1}{2}^{\text{h}}$; the width about the 6^{h} portion is very much narrower, and, according to the Oxford survey, of about half the star density, presumably to the eleventh magnitude stars, the extent in R.A. is apparently $4\frac{3}{4}^{\text{h}}$ to $7\frac{1}{4}^{\text{h}}$ (in reality it is $5^{\text{h}}\ 20^{\text{m}}$, as there is an extraordinary scarcity of faint stars during R.A. $4^{\text{h}}\ 0^{\text{m}}$ to 5^{h}, with a very precipitous rise—a perfect wall of stars—at $5^{\text{h}}\ 15^{\text{m}}$); thus, $6\frac{1}{4}^{\text{h}}$ against 2^{h}. The minimum is at 11^{h} and 13^{h}; there is a small yet distinct rise at 12^{h}, with an "accidental" minimum at 4^{h}, possibly a small or confined stellar vacuity and peculiar to the Oxford zones.

TABLE VII.

Dec.	Number of Plates.	Stars Measured.	Stars in a Square Degree.	Average Number of Stars each Plate.	Number measured *plus* the Extra Stars indicated in Table VI.	Stars in a Square Degree.
+25°	138	34141	52·6			
	180	47428	56·2	263·5	49215	57·8
+26	118	31877	57·4			
	180	60212	71·5	335·5	66776	78·9
+27	106	26545	53·3			
	180	53241	63·1	295·8	54984	65·1
+28	56	18103	68·8			
	160	52926	70·5	330·8	60216	80·2
+29	97	30853	67·6			
	160	53272	71·0	333·0	61474	81·8
+30	0	0	...			
	160	66900	89·2	418·1	83952	111·8
+31	0	0	...			
	160	65826	87·7	411·4	67650	89·9
Sum or Mean	513 1180	399805	72·3	338 8	444267	80·2

I wish to express my thanks to Mr. E. A. Gray, Mr. F. H. Scragg, and Mr. F. F. Lovegrove for assistance in collecting the data upon which the tables are based.

University Observatory, Oxford:
1904 *April* 7.

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A New Cluster in Cygnus, with Right Ascensions and Declinations of 103 *Stars included in it.* By F. A. Bellamy.

1. At the end of last year I exposed a plate for the purpose of obtaining a photograph of the region of Dr. Max Wolf's new variable B.D. +37° 3876 (No. 59, 1903, *Cygni*) in order to measure the positions of stars surrounding it. The plate (2294) was exposed for 10^m and 16^m on 1903 October 9, and the adopted centre is +37°, 20^h 16^m: the hour angle was about 4^h west. The plate probably contains stars fainter than the 13th magnitude.

2. Whilst proceeding with the measurement of stars close to the variable I was impressed with the appearance of a well-defined and compact cluster of stars about $1\frac{1}{2}^m$ away and became interested in ascertaining its name. Upon reference to Dreyer's "New General Catalogue of Nebulæ and Clusters" (*Memoirs, R.A.S.*, vol. xlix. p. 1) I failed to find any mention made about it, nor could I find it referred to in his additional catalogue (*Memoirs, R.A.S.*, vol. li. p. 185). Such being the case it occurred to me that it was desirable to fix the stars' positions, and the results form the basis of this communication.

3. Without further description, it need only be said that the plate was exposed in the 13-inch astrographic telescope, which was moved in decl. about 45″ between the two exposures, that I measured both images in two positions of the plate 180° apart, using the glass-ruled scale in the microscope, the means of these four measures in each coordinate were carried to the fourth decimal—*i.e.* to a unit ·0001 = 0″·03. The calculations were made according to the formulæ published by Professor Turner.

4. The reference stars for the purpose of determining the plate constants have been selected from the Lund A.G.C. These positions have been brought to the epoch 1900·0 with precessions given in that catalogue, but no proper motions have been applied. The standard coordinates ξ and η referred to the plate centre +37°, 20^h 16^m, were computed for fifteen stars chosen in the SW, NW, NE, SE corners of the plate and about 45′ from the plate centre. If we put ξ' and η' equal to $\xi+13$ and $\eta+13$ respectively we shall obtain the coordinates referred to the corner of the réseau; they will always be positive, and are easily compared with the measured x and y. Putting $ax+by+c=x-\xi$ and $dx+ey+f=y-\eta$, the values of a, b, &c., were found to be

a	*b*	*c*	*d*	*e*	*f*
−·00068	+·00601	+·0863	−·00609	−·00073	−·0360

These are derived from the mean of the two exposures. It is not considered that any appreciable error is introduced in the present case by proceeding in this way rather than by treating the exposures separately, and a great deal of work is saved